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10/669,542	09/23/2003	Akash R. Deshpande	60981-8010.US02	4648

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EXAMINER	
ZHEN, LI B	
ART UNIT	**PAPER NUMBER**
2194	
MAIL DATE	**DELIVERY MODE**
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/669,542	DESHPANDE, AKASH R.	
	Examiner	Art Unit	
	Li B. Zhen	2194	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 July 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *30-63* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *30-58 and 61-63* is/are rejected.

7)☒ Claim(s) *59 and 60* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 30 – 63 are pending in the application.

Response to Arguments

2. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

Allowable Subject Matter

3. Claims 59 and 60 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims and rewritten to overcome the claim objections.

Claim Objections

4. Claims 31- 37, 39 – 45 and 47 – 63 objected to because of the following informalities:

a. Dependent claims 31 – 37 and 52, 55 – 61 should start with "The method", as they appear to refer to "A method" of independent claim 30.

b. The limitation "The computer program product" in dependent claims 39 – 45, 53 and 62 lacks antecedent basis.

c. Dependent claims 47 – 51, 54 and 63 should start with "The system", as they appear to refer to "A system" of independent claim 46.

d. Appropriate correction is required.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 30 – 58 and 61 – 63 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,434,590 to Blelloch et al. [hereinafter Blelloch] in view of U.S. Patent No. 5,954,792 to Balarin [previously cited].

7. As to claim 30, Blelloch teaches the invention substantially as claimed including a method of scheduling a plurality of components [particular sequential scheduler is selected for use in determining priorities among tasks; col. 4, lines 21 – 39] to be performed by a computing device [system SY1; col. 2, lines 42 – 52], each component having a scheduled component start time [each task has a designation identifying its order in the schedule; col. 4, lines 9 – 16 and lines 21 – 39] and including a plurality of actions [grouping sequences of actions of a thread into larger " tasks"; col. 12, lines 2 – 16], each of the plurality of actions being non-preemptive and suitable for execution by the computing device [scheduler is non-preemptive (threads execute uninterrupted until they suspend, fork, allocate memory or terminate); col. 10, lines 24 – 36], and each of

the plurality of non-preemptive actions having a scheduled action start time [a sequential schedule; col. 8, line 43 – col. 9, line 12], said method comprising:

determining an earliest action start time [selects a subset of available tasks for parallel processing by assigning higher priorities to the earlier available tasks in the sequential schedule; col. 4, lines 15 – 22] from among the plurality of scheduled action start times for the plurality of non-preemptible actions [scheduler is non-preemptive; col. 9, lines 41 – 56];

identifying an earliest component having the earliest action with the earliest action start time [maintaining the threads prioritized by their sequential execution order; col. 10, lines 24 – 35]; and

executing a first action, which has the earliest action start time of the plurality of actions [non-preemptive (threads execute uninterrupted until they suspend, fork, allocate memory or terminate); col. 10, lines 25 – 36] from the identified earliest component to completion without preemption [col. 11, lines 7 – 29]. Although Blelloch teaches the invention substantially, Blellcoh does not specifically teach obtaining a returned event from the executed first action and propagating the returned event to a second action from dependent components of the earliest component.

However, Balarin teaches non-preemptive static priority scheduling [col. 5, lines 40 – 46], obtaining a returned event from said executed action in accordance with said executing [Tasks are enabled either by external events or by execution of other tasks (internal events); col. 4, lines 15 – 30]; and propagating said returned event to a second action from dependent components of the earliest component [Events are denoted by

ordered pairs (i,j) where j is an internal task and i is either an internal task (in which case the event is said to be "internal"); col. 4, lines 36 – 66].

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the invention of Blelloch to include the features of obtaining a returned event from the executed action and propagating the returned event to a second action from dependent components of the earliest component because this provides efficient methods for verifying the timing behavior of a system in which various tasks are executed on a processor, and each task is enabled in response to the occurrence of an external event and the completion of another task [col. 3, lines 13 – 21 of Balarin].

8. As to claim 38, this is a product claim that corresponds to method claim 30; see the rejection to claim 30 above, which also meets this product claim.

9. As to claim 46, Blelloch as modified by Balarin teaches a system for scheduling [col. 4, lines 21 – 39 of Blelloch] a plurality of components [col. 4, lines 9 – 16 and lines 21 – 39 of Blelloch], the system [system SY1; col. 2, lines 42 – 52 of Blelloch] comprising:

a computing device configured to receive a plurality of components [col. 2, lines 42 – 52 of Blelloch], each component having a scheduled component start time [col. 4, lines 15 – 22 of Blelloch] and each component including a plurality of actions [scheduler is non-preemptive; col. 9, lines 41 – 56 of Blelloch], each of the plurality of actions being

non-preemptible and suitable for non-preemptive execution [col. 10, lines 24 – 36 of Blelloch] by the computing device [col. 9, lines 41 – 56 of Blelloch] and each of the plurality of non-preemptible actions having a scheduled action start time [col. 10, lines 24 – 35 of Blelloch]; and

a scheduling program in communication with the computing device, the scheduling program [scheduler is non-preemptive; col. 9, lines 41 – 56 of Blelloch] configured to:

determine an earliest action start time [col. 4, lines 15 – 22 of Blelloch] from among the plurality of scheduled action start times for the plurality of non-preemptible actions [col. 9, lines 41 – 56 of Blelloch];

identify an earliest component having the earliest action start time [col. 10, lines 24 – 35 of Blelloch];

select for execution by the computing device [col. 23, lines 50 – 67 of Blelloch], to completion without preemption [col. 10, lines 24 – 36 of Blelloch], a first action, which has the earliest action start time of the plurality of actions from the identified earliest component [col. 8, line 43 – col. 9, line 12 of Blelloch];

obtain a returned event from said executed first action [Tasks are enabled either by external events or by execution of other tasks (internal events); col. 4, lines 15 – 30 of Balarin]; and

propagate said returned event to a second action from the earliest component [Events are denoted by ordered pairs (i,j) where j is an internal task and i is either an

internal task (in which case the event is said to be "internal"); col. 4, lines 36 – 66 of Balarin].

10. As to claim 31, Blelloch teaches the plurality of components each have a unique identifier used to select the earliest component from the plurality of components, and wherein a plurality of components each have an action with the earliest start time [col. 10, lines 24 – 35], the act of identifying the earliest component comprising selecting the earliest component from the plurality of components having an action with the earliest start time based on the unique identifiers [a code or characterization that identifies the ordering of the task in the sequence of instructions; col. 4, lines 8 – 15].

11. As to claim 32, Blelloch teaches the first action is selected from those actions that have a same earliest start time based on a predefined preference associated with the first action [col. 4, lines 15 – 22].

12. As to claim 33, Blelloch teaches dividing at least one of said components into said plurality of non-preemptible actions [col. 19, line 56 – col. 20, line 7], wherein each of said plurality of actions are scheduled for non-preemptive execution and are non-preemptively executed [col. 10, lines 24 – 36].

13. As to claim 34, Blelloch as modified teaches receiving an interrupt after the act of identifying an earliest action start time [col. 10, lines 24 – 35 of Blelloch] and before the

act of executing the first action [external events, col. 4, lines 15 – 28 of Balarin], and in accordance therewith servicing said received interrupt and then performing again the act of identifying the earliest component having the earliest action with the earliest action start time [col. 4, lines 15 – 22 of Blelloch], wherein said interrupt corresponds to one of a shell command and a connection request [col. 3, lines 18 – 26 of Blelloch].

14. As to claim 35, Blelloch as modified teaches receiving an interrupt after the act of identifying an earliest component and before the act of executing [external events, col. 4, lines 15 – 28 of Balarin], and in accordance therewith identifying a component corresponding to said interrupt and a reactive action [col. 6, line 60 – col. 7, line 2 of Balarin] therein, and in accordance therewith executing said reactive action instead of the identified earliest action [col. 10, lines 24 – 35 of Blelloch], wherein said interrupt corresponds to an alert input [col. 6, lines 26 – 47 of Balarin].

15. As to claim 36, Blelloch as modified teaches receiving an interrupt after the act of identifying an earliest component and before the act of executing [external events, col. 4, lines 15 – 28 of Balarin], and in accordance therewith serving said interrupt and then identifying a component corresponding to said interrupt and a reactive action [col. 6, line 60 – col. 7, line 2 of Balarin] therein , and in accordance therewith executing said reactive action instead of the identified first action [col. 10, lines 24 – 35 of Blelloch], wherein said interrupt corresponds to one of a hardware interrupt having an interrupt

service routine and a software interrupt having said interrupt service routine [col. 6, lines 26 – 47 of Balarin].

16. As to claim 37, Blelloch as modified teaches each component of said plurality of components further includes a plurality of states [condition; col. 9, line 60 – col. 10, line 14 of Balarin], and the method further comprising: updating one or more state of said plurality of states related to the earliest component, after said propagating [col. 9, lines 4 – 20 of Balarin].

17. As to claim 39 – 45, these are product claims that correspond to method claims 31 – 37; see the rejection to claims 31 – 37 above, which also meet these product claims.

18. As to claim 47 – 51, these are system claims that correspond to method claims 31 – 34 and 37; see the rejection to claims 31 – 34 and 37 above, which also meet these product claims.

19. As to claim 52, Blelloch teaches all of the components to be performed by the computing device are performed non-preemptively using non-preemptible actions implemented as function calls without context switching [col. 10, lines 24 – 36].

20. As to claim 53, Blelloch teaches all of the components to be performed by the computing device are performed non-preemptively using non-preemptible actions implemented as function calls without context switching [col. 10, lines 24 – 36].

21. As to claim 54, Blelloch teaches all of the components to be performed by the computing device are performed non-preemptively using non-preemptible actions implemented as function calls without context switching [col. 10, lines 24 – 36].

22. As to claim 55, Blelloch teaches the determining an earliest action start time is a dynamic determination wherein the earliest action start time is computed dynamically at the end of execution of each action [computation graphs are generated dynamically; col. 11, lines 7 – 29].

23. As to claim 56, Blelloch teaches each action is executed as a function call, and each action includes one or more instructions [a set of threads, each comprised of a sequence of instructions; col. 10, lines 43 – 65].

24. As to claim 57, Blelloch teaches there is no priority-based scheduling of actions, and no preemption of any executing actions, including no preemption of an executing action by an interrupt [col. 10, lines 24 – 36].

25. As to claim 58, Blelloch teaches the method provides a scheduler that examines the actions which are implemented as function calls [col. 14, line 60 – col. 15, line 16], and schedules them so that all of the ready actions are executed in the order they are required to be executed by the application [col. 9, lines 41 – 56].

26. As to claim 61, Blelloch teaches each of the plurality of components consists of a plurality of actions [col. 12, lines 2 – 16].

27. As to claim 62, Blelloch teaches each of the plurality of components consists of a plurality of actions [col. 12, lines 2 – 16].

28. As to claim 63, Blelloch teaches each of the plurality of components consists of a plurality of actions [col. 12, lines 2 – 16].

Conclusion

29. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

"On Non-Preemptive Scheduling of Periodic and Sporadic Tasks" discloses scheduling periodic and sporadic tasks with an earliest deadline first scheduling algorithm.

CONTACT INFORMATION

30. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Li B. Zhen whose telephone number is (571) 272-3768. The examiner can normally be reached on Mon - Fri, 8:30am - 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Thomson can be reached on 571-272-3718. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Li B. Zhen
Examiner
Art Unit 2194

LBZ

9/29/2007